

Fundamentals of Agricultural Entomology



Shravan M. Haldhar
Hanuman L. Deshwal



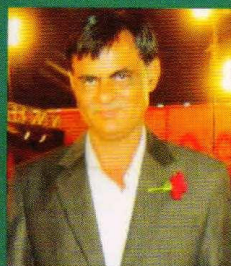
New Vishal
PUBLICATIONS

This book has been prepared on the persistent demand of the student who requires themselves to adopt entomology as a professional carrier. The book would have useful to students' preparation for various competitive examinations conducted by State Agricultural Universities (B. Sc. Ag, M. Sc. & Ph. D Entomology examination), Agricultural Scientific Recruitment Board (ARS/NET), Indian Council of Agricultural Research (M. Sc. & Ph. D examination), National Academy of Agricultural Research Management (SRF), Indian Agricultural Research Institute (Ph. D entrance), University Grant Commission, Union Public Service Commission, other agencies and also useful to teachers to keep them abreast with recent developments in entomology and guide their students to a better future.



Shравan M Haldhar is presently working as scientist (Agril Entomology) at ICAR-Central Institute for Arid Horticulture, Bikaner, Rajasthan, India. He did his Ph. D in Insect Taxonomy from Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan in 2008. He has

published 05 international and 16 national research papers in reputed peer reviewed journals. He has also published 03 books and 04 technical bulletins. He is a editor of 04 international journals.



Hanuman L Deshwal is presently working as Associate Professor (Entomology) in All India Network Project on Arid Legumes at Agricultural Research Station, Bikaner, Rajasthan. He did his Ph. D in Entomology from Swami Keshwanand Rajasthan

Agricultural University, Bikaner, Rajasthan in 2007. He has awarded University Gold Medal at Post graduation level and qualified National Eligibility Test (NET) of ICAR in 1995 and 1996. He has 20 years experience of teaching, research and extension and guided 10 M. Sc students as major advisor and one Ph. D student as major co-advisor. He has published several research papers, popular articles, bulletins and practical manuals in reputed journals/magazines.

Fundamentals of Agricultural Entomology



Shравan M. Haldhar
Hanuman L. Deshwal

ISBN 819333970-3



Price : ₹ 410/-

Published by :

**New Vishal
Publication**

E/153, West Patel Nagar,
New Delhi-110008

Phone : 011-47068087

www.newvishal.weebly.com

Edition: February, 2017

© Copyright Reserved with the Author

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying or otherwise without the prior permission of the copyright owner.

Note : Due care and diligence has been taken while editing and printing the book, neither the author nor the publisher of the book hold any responsibility for any mistakes that may have inadvertently crept in.

Publisher shall not be liable for any direct, consequential, or incidental damages arising out of the use of the book.

In case of binding mistake, misprints, or for missing pages etc., Publisher's entire liability, and your exclusive remedy, is replacement of the book within one month of purchase by similar edition of the book.

All disputes are subject to the exclusive jurisdiction of Delhi Courts only.

Printed and bound in India.

Published by:

NEW VISHAL PUBLICATIONS

E-153, West Patel Nagar,

New Delhi-110008

Ph. : 9811251105, 9868437555, 9968622711

E-mail : nvpbooks@hotmail.com

Website : www.newvishal.weebly.com

Available in Delhi at:

Pusa Agricultural Books Service

29, Shishir Hostel, IARI, Delhi-12, Ph. : 011-25841048, 9868827628

E-mail: pusa.agri@gmail.com

Graphics and laser typesetting by :

Oberoï Graphics, New Delhi

Printed at :

Giriraj Printers, Jhilmill Industrial Area, Delhi

CONTENTS

Chapter No.	Topics	Page No.
1.	History of Entomology in India Factors for insect dominance. Classification of phylum Arthropoda upto classes. Taxonomy -importance, history and binomial nomenclature. Definitions of species, sub-species sibling species and biotype.	10 - 40
2.	Classification of class Insecta-I Orthoptera- Acrididae, Isoptera- Termitidae, Thysanoptera- Thripidae, Hemiptera-Pentatomidae, Coreidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Aleurodidae, Pseudococcidae.	41 - 55
3.	Classification of class Insecta-II Lepidoptera-Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae; Coleoptera- Coccinellidae, Galerucidae, Cerambycidae, Curculionidae, Bruchidae, Melonithidae.	56 - 66
4.	Classification of class Insecta-III Dictyoptera- Mantidae, Blattidae; Hymenoptera- Tenthredinidae, Apidae, Trichogrammatidae, Ichneumonidae, Braconidae; Diptera- Cecidomyiidae, Trypetidae, Tachinidae, Agromyzidae.	67 - 76
5.	Structure and functions of external body Structure and functions of insect cuticle and moulting. Body segmentation: structure of head, thorax and abdomen of grasshopper. Sensory organs. Metamorphosis in insects. Types of larvae and pupae. Structure and modifications of insect antennae, mouth parts and legs. Wing venation, modifications and wing coupling apparatus.	77 - 113

6.	Structure and functions of internal body Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretory (endocrine) and reproductive systems in grasshopper. Types of reproduction in insects.	114 - 141
7.	Study on phytophagous mites Phytophagous mites: General morphology and biology. Important species of mites of Agricultural importance (<i>Petrobia latens</i> , <i>Larvacarus transitans</i> , <i>Eutetranychus orientalis</i> and <i>Tetranychus cinnabarinus</i>), nature and extent of damage and their management.	142 - 149
8.	Study on beneficial insects Honeybee- Important species, rearing techniques, diseases and natural enemies. Silkworm- Important species, rearing techniques, diseases and natural enemies. Lac insect- Rearing techniques, diseases and natural enemies.	150 - 184
9.	Study on entomological pests-I Polyphagous pests: Red hairy caterpillar, White grub, Termite, Locust, Grasshopper.	185 - 196
10.	Study on entomological pests-II Distribution, biology, nature and symptoms of damage, and management of insect pests of rice, sugarcane, cotton, pulses (Gram and Kharif pulses).	197 - 233
11.	Study on entomological pests-III Distribution, biology, nature and symptoms of damage, and management of insect pests of pearl millet, sorghum, maize, wheat, groundnut, castor, sesame, sunflower, mustard, soybean.	234 - 267
12.	Study on entomological pests-IV Distribution, biology, nature and symptoms of damage, and management of insect pests of brinjal, okra, tomato, cruciferous and cucurbitaceous vegetables, potato, chillies, onion, garlic.	268 - 295

13.	Study on entomological pests-V Distribution, biology, nature and symptoms of damage and management of insect pests of mango, citrus, pomegranate, guava, ber, apple, coconut and ornamental plants.	296 - 323
14.	Study on entomological pests-VI Stored grain pests: Coleopteran and Lepidopteran pests, their identification, biology and damage. Preventive and curative methods for control of stored grain pests.	324 - 339
15.	Integrated pest management (IPM) system IPM: Introduction, importance, scope, concepts and limitations. Tools of IPM- Host plant resistance, cultural, mechanical and physical, legislative and biological control (parasites, predators and pathogens such as bacteria, fungi and viruses).	340 - 355
16.	Chemical pesticides control Chemical control- Classification, toxicity and formulations of insecticides. Study of important insecticides- Botanicals, chlorinated hydrocarbons, organophosphates, carbamates, synthetic pyrethroids and novel insecticides, chitin synthesis inhibitors, rodenticides, acaricides and fumigants. Insecticides Act 1968- Important provisions. Application techniques of insecticides. Symptoms of insecticide poisoning, first aid and antidotes.	356 - 382
17.	Non-chemical pesticides control Hormones and pheromones, repellents, antifeedants, attractants, gamma radiation and genetic control.	383 - 391
18.	Biological control-I Definition, concept and principles of biological control. Attributes of an effective natural enemies. Types of natural enemies- Parasitoids and predators. Techniques of biological control.	392 - 404
19.	Biological control-II Microbial control- Pathogenicity, virulence and factors that enhance the use of microorganisms. Classification, mode of action and uses of microbial agents, factors	405 - 415

	influencing their effectiveness. Advantages and limitations of biological control in IPM. Role of biological control in IPM. Mass production and multiplication of biocontrol agents- viruses, bacteria, fungi and parasitoids and predators and their application techniques. Potential of plant products in IPM.	
20.	Study on insect ecology Insect Ecology: Definition, scope and concept. Environment and its components. Agroecosystem. Effect of abiotic factors- temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents. Effect of biotic factors - positive and negative interactions. Causes of pest outbreak. Pest surveillance and forecasting. Categories of pests.	416 - 430
21.	Study on rodents Rodents: Rodent pests of agricultural importance. Field and storage losses due to rodents. Taxonomy, distribution, habitat behavior, burrowing pattern and breeding potential. Methods of rodent management in field and godowns - mechanical, physical, biological, chemical (rodenticides, fumigants etc.). Bait shyness and bait preference. Other methods- sanitation, rodent proof structures, electromagnetic repellents etc.	431 - 442
22.	Study on agricultural ornithology Agricultural Ornithology: Important phytophagous bird species in India, potential losses, host range, feeding behaviour and management. Snails and Slugs: Important species of agricultural importance. Mammal pests: Major mammals of agricultural importance, nature of damage and management.	443 - 451
	References	452